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**CALCULATING AVERAGE PREDICTED LOAD TIMES AND
PREDICTED LOAD TIMES AT AVERAGE VOLUMES**

CALCULATING AVERAGE PREDICTED LOAD TIMES AND PREDICTED LOAD TIMES AT THE AVERAGE VOLUMES

In support of the Direct Testimony of Postal Service Witness Donald M. Baron (USPS-T-12), in Docket No. R2000-1, this library reference documents the use of the city carrier letter route load-time regressions to estimate two alternative point estimates for each of the three letter-route stop types: SDR, MDR, and BAM. The first estimate, called \bar{L} , is the average of the regression-predicted load times. The second estimate, $\hat{g}(V/S)$, is the load time that the regressions predict at the average values for the independent variables. $\hat{g}(V/S)$ is also called load time at the stop that receives the average volumes per stop, since the most important independent variables in the load-time variability analysis are the letter-shaped pieces, flat-shaped pieces, parcel-shaped pieces, and accountables that carriers deliver at the SDR, MDR, and BAM stops.

These two point estimates are defined and described in Witness Baron's direct testimony.

The current library reference also documents the use of FY 1998 CCS data to calculate average volumes per stop for the letters, flats, parcels and accountables variables in the load-time regressions, and the use of 1985 load-time test data to calculate averages per stop for the other right-hand side variables in the regressions. It shows how these averages are substituted into the regressions to produce the alternative load-time point estimates, and to produce updated load-time elasticities for letters, flats, parcels, accountables, collections, and deliveries.

The library reference is organized into five sections as summarized below.

1. Program Documentation –

This documentation reviews the SAS program LOAD98.CNTL. It describes how this program estimates the load time regressions, and then uses those regressions to derive average load times per stop, load times at stops receiving mail volumes equal to the average daily mail volumes over all letter routes, and load-time elasticities.

2. Input Data Files –

This section describes the data files that are read into LOAD98.CNTL to produce the load-time regressions and alternative load-time estimates.

3. ***Program Listing*** - A printout of the SAS program LOAD98.CNTL.
4. ***Output Listing*** - A printout of the Output from LOAD98.CNTL.
5. ***A Floppy Disk Containing the LOAD98.CNTL Program.***

1. Program Documentation

The program LOAD98.CNTL first reads in the data set LTV.FLAT.DATA. This data set contains the load times and delivery and collection volumes that were recorded during the 1985 load-time field survey. This survey conducted tests at approximately 20,000 carrier stops made on 400 sampled letter routes. Each test recorded the amounts of time carriers spent performing loading activities, the volumes of letters, flats, parcels, and accountable volumes delivered, the volumes collected, and various non-volume characteristics, such as the carrier's container type, and the receptacle type and numbers of possible deliveries at the stop location.

A complete description of the 1985 load-time test, the data it collected, and the compilation of that data into the database used to estimate load-time regressions is presented in the Direct Testimony of Peter D. Hume, Docket No. R87-1, USPS-T-7 and Exhibit USPS-7C. Docket No. R87-1, USPS LR-E-4 presents the field instructions and data collection forms for the load-time test. It also defines the variables created on the load-time database that was compiled from test observations. Docket No. R87-1, USPS LR-E-5 explains how this database was constructed.

LOAD98.CNTL next uses the data from LTV.FLAT.DATA to estimate the SDR, MDR, and BAM load-time regressions and to calculate average 1985 values for the right-hand side variables in those regressions. These regressions are the models that the Postal Rate Commission recommended in its Docket No. R90-1 Decision, and both the Commission and the Postal Service have used these regressions ever since that Decision to derive volume-variable load-time costs.

These 1985 variable averages and the estimated regression coefficients are saved in separate output files. One set of files is produced for each stop type.

LOAD98.CNTL then inputs the FY 1998 City Carrier Cost System (CCS) files. These are four quarterly data sets that contain the observations recorded during tests conducted at 205,028 SDR stops, 18,511 MDR stops, and 22,999 BAM stops on the FY 1998 CCS sample routes.¹ LOAD98.CNTL next creates three separate files, one each for the SDR, MDR, and BAM stop types, and it calculates weighted and unweighted average daily FY 1998 CCS pieces per actual stop by stop type for total letters, flats, parcels, accountables, and possible deliveries. Values for actual deliveries per stop at all MDR and BAM stops are estimated through substitution of FY 1998 CCS test volumes for the mail subclass, subclass aggregate, and possible delivery variables in the actual

¹ See Docket No. R2000-1, USPS-T-3, LR-I-16, and LR-I-19 for documentation describing the CCS data files.

deliveries regressions.² After calculating weighted and unweighted averages of these estimated actual deliveries, the program prints out these averages along with the weighted and unweighted averages for letters, flats, parcels, accountables, and possible deliveries.

These averages are also stored on output data sets, which are merged with the original CCS data sets, and with the data sets containing the averages of the 1985 load time data and the regression coefficients. The two load-time estimates reported in table 1 on page 19 of USPS-T-12 are then calculated for each stop type.

To calculate the first estimate - the average of the predicted load times - the program substitutes FY 1998 CCS volumes per actual stop for the letters, flats, parcels, and accountables variables in each regression. 205,028 such substitutions are made into the SDR regression, 18,511 substitutions are made into the MDR regression, and 22,999 are made into the BAM regression. One substitution is made for each test conducted at a covered stop. For the MDR and BAM stop types, 18,511 and 22,999 values for possible delivery per actual stop are also substituted into the respective regressions.

These substitutions, along with substitutions of 1985 data set averages per stop for collections, the container-type dummy variables, and the receptacle-type dummy variables produce an equal number of predicted load times per stop for each stop type. The program multiplies each predicted value by a sample weight that accounts for the number of population stops represented by the CCS test that produced this value. The program then calculates the average of the predicted load-times per stop as the sum of these weighted predicted load times divided by the corresponding number of FY 1998 tests (205,028 for SDR stops, 18,511 for MDR stops, and 22,999 for BAM stops).

To calculate the second set of estimates in table 1 - namely, the load times predicted at the average of the right-hand side regression variables - LOAD98.CNTL first substitutes sample-weighted average CCS volumes per stop for the letters, flats, parcels, and accountables variables in each regression. Next the program substitutes the averages of the 1985 collection volumes and container-type and receptacle-type variables. The program further substitutes weighted average CCS possible deliveries per stop into the MDR and BAM regressions. All of these substitutions produce the load times predicted by the regressions at an actual stop that has the average volumes and possible deliveries per stop.

These average right-hand side variable values and corresponding predicted load times are then used to estimate the load time elasticities. To

² The estimation of these regressions is documented in Docket No. R97-1, USPS LR-H-139.

derive these elasticities, LOAD98.CNTL also uses the regressions to calculate partial derivatives of load time with respect to the volume and deliveries variables. These partial derivatives are calculated at the average weighted volumes and, for MDR and BAM stops, at the average weighted estimated actual deliveries as well.

The program calculates an elasticity for each volume term as the product of the partial derivative with respect to this volume, the average of this volume, and the load time predicted at the combination of this average and the averages for all other right-hand side variables of the given regression. For MDR and BAM stops, the program calculates an elasticity of load time with respect to actual deliveries as the product of the partial derivative of load time with respect to estimated actual deliveries, the average of the weighted estimated actual deliveries, and the predicted load time.

2. Input Data Files

The following summary describes the LTV.FLAT.DATA file and the four quarterly "ALDRAN" data files that are read into the SAS program LOAD98.CNTL.

1. LTV.FLAT.DATA

Number of observations: 20,167

Number of variables: 48

The subset of these variables that is used in the LOAD98.CNTL program is as follows:

SER	-	1985 Test Serial Number
NOM	-	No Mail at Stop
DLETTERS	-	Letter Volume Loaded at a Stop
DFLATS	-	Flat Volume Loaded at a Stop
DPARCELS	-	Parcel Volume Loaded at a Stop
STYPE	-	Stop Type Code
RCODE	-	Receptacle Type Code
CCODE	-	Container Type Code
PREP	-	Portion of Load Time Spent Preparing Mail for Delivery
LOAD	-	Portion of Load Time Spent Actually Loading Mail
ATTEND	-	Portion of Load Time Spent Serving or Waiting on an Individual Customer
PDS	-	Possible Deliveries at a Stop
CLETTERS	-	Letter Volume Collected at a Stop
CFLATS	-	Flat Volume Collected at a Stop
CPARCELS	-	Parcel Volume Collected at a Stop
COD	-	Volume of COD Mail Loaded at a Stop
ACC	-	Volume of Accountables, Other than COD, Loaded at a Stop

2. ALDRAN.CITY.PQTOTAL.PQ1FY98, ALDRAN.CITY.PQTOTAL.PQ2FY98, ALDRAN.CITY.PQTOTAL.PQ3FY98, and ALDRAN.CITY.PQTOTAL.PQ4FY98

These "ALDRAN" files contain the four quarterly FY 1998 CCS data sets that consist of the mail volumes and deliveries data collected during the FY 1998 tests conducted at SDR, MDR, and BAM stops on the CCS sample of city carrier letter routes.

The ALDRAN file variables that are used in the LOAD98.CNTL program are:

D2	-	1 st Class Single Piece Mail Volume
D3	-	1 st Class Automated and Nonautomated Presorted Letters, Flats, and Parcels Volume
D20	-	1 st Class Carrier-Route Presorted Letters, Flats, and Parcels Volume
D4	-	1 st Class Single Piece Postcard Volume
D5	-	1 st Class Automated and Nonautomated Presorted Postcard Volume
D21	-	1 st Class Carrier-Route Presorted Postcard Volume
D7	-	Priority Mail Volume
D8	-	Express Mail Volume
D9	-	Mailgrams Volume
D10	-	Total Periodicals Volume
D12	-	Standard A Single Piece Volume
D14	-	Standard A Enhanced Carrier-Route Volume
D15	-	Standard A Automated and Nonautomated Regular Presort Volume
D18	-	Standard A Nonprofit Enhanced Carrier-Route Volume
D19	-	Standard A Nonprofit Automated and Nonautomated Regular Presort Volume
D23	-	Standard B Parcel Post Volume
D24	-	Standard B Bound Printed Matter Volume
D25	-	Standard B Special Volume
D26	-	Standard B Library Volume
D28	-	USPS Penalty Mail Volume
D29	-	Free for the Blind and Handicapped Mail Volume
D31	-	International Surface Volume
D33	-	International Surface Parcel Post Volume
D34	-	International Surface M-Bag Volume
D35	-	International Surface AO Volume
D36	-	International Air Letter Volume
D37	-	International Air AO Volume
D38	-	International Air Parcel Post Volume
D39	-	International Air M-Bag Volume
D40	-	International Air Express Mail Volume
A44	-	Postage Due Accountables
A45	-	Business Reply Accountables
A46	-	Certified Accountables
A47	-	COD Accountables
A48	-	Insurance Accountables
A49	-	Registry Accountables

A50	-	Registry/COD Accountables
A51	-	Return Receipts Accountables
A52	-	Express Return Receipts Accountables
A53	-	Other Accountables
A55	-	All Other Mail
WGT	-	Sample Weight, which is an expansion factor that accounts for the number of population stops that the given test CCS stop represents
A1-A32	-	D1-D32 for Letter-Shaped Pieces Only
B1-B32	-	D1-D32 for Flat-Shaped Pieces Only
C1-C32	-	D1-D32 for Parcels Only
POSBUS	-	Possible Business Deliveries at the Stop
POSRES	-	Possible Residential Deliveries at the Stop
BUSDELV	-	Actual Business Deliveries at the Stop
RESDELV	-	Actual Residential Deliveries at the Stop
RCAT	-	Route Category Indicator (1 = business foot route, 2 = business motorized route, 3 = residential foot route, 4 = residential park & loop route, 5 = residential curb route, 6 = mixed foot route, 7 = mixed park & loop route)

3. *Program Listing*

The following is the printout of the LOAD98.CNTL SAS statements.